



Sun StorEdge™ DLT8000 Tape Drive Installation and User's Guide

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Preface

The *Sun StorEdge™ DLT8000 Tape Drive Installation and User's Guide* provides installation instructions and user information for the Sun StorEdge™ DLT8000 tape drive. These instructions are intended for system administrators.

How This Book Is Organized

Chapter 1, “Installation,” provides instructions on how to install the tape drive into systems or enclosures. The steps in this chapter must be performed together with installation instructions specific to the system or enclosure into which the tape drive will be installed. This chapter also includes troubleshooting information.

Chapter 2, “Operation,” provides information about using the tape drive.

Appendix A, “Modifying the `st.conf` File,” provides instructions on how to modify the `st.conf` file for tape drives that are being connected to workstations using the Solaris™ 2.5, 2.5.1, 2.6 and 2.7 operating environments.

Appendix B, “Specifications,” provides specifications for the tape drive and tape cartridge.

Using UNIX Commands

This document may not contain information on basic UNIX[®] commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris Handbook for Sun Peripherals*
- AnswerBook2[™] online documentation for the Solaris operating environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface	Meaning	Examples
AaBbCc123	The names of commands, files, and directories; on-screen computer output	Edit your <code>.login</code> file. Use <code>ls -a</code> to list all files. % You have mail.
AaBbCc123	What you type, when contrasted with on-screen computer output	% su Password:
<i>AaBbCc123</i>	Book titles, new words or terms, words to be emphasized	Read Chapter 6 in the <i>User's Guide</i> . These are called <i>class</i> options. You <i>must</i> be superuser to do this.
	Command-line variable; replace with a real name or value	To delete a file, type <code>rm filename</code> .

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	<i>machine_name%</i>
C shell superuser	<i>machine_name#</i>
Bourne shell and Korn shell	\$
Bourne shell and Korn shell superuser	#

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Installation

This chapter describes how to install, configure, and troubleshoot the DLT8000 tape drive.

Installing the Tape Drive

▼ To Install the Tape Drive

1. **Determine your operating environment using the `uname -rs` command.**



Caution – If your system uses the Solaris 2.5, 2.5.1, 2.6, or 2.7 operating environments, you must perform the procedures in Appendix A before proceeding.

2. **Shut down the operating environment.**

Use either the `init` or `shutdown` command. See the man pages for these commands or the Solaris AnswerBook2 online documentation for more information.

3. **Find an available SCSI device identifier (SCSI ID) for the tape drive.**

To check for an available SCSI ID, type `probe-scsi-all` at the `ok` prompt. Use a SCSI ID that is not returned by this command. Tape drives are usually set to a SCSI ID of 4 or 5. Write down the SCSI ID (and SCSI host adapter identifier) for future use.

Note – Do not choose SCSI ID 7; it is reserved for the host adapter.

4. Power off your system and then your peripherals.

5. Prepare your system or enclosure for servicing.

Follow the procedures in the service manual for your system or enclosure.

6. Install the tape drive.

Refer to the procedures in your system or enclosure service manual. Install this drive as you would any full-height device.

- a. Connect the SCSI and power cables to the connectors on the back of the tape drive.**

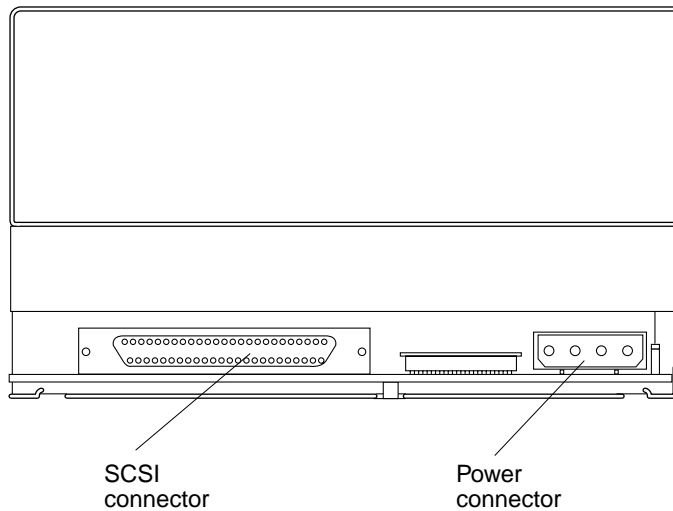


FIGURE 1-1 DLT8000 Tape Drive Cable Connectors

b. Set the SCSI ID.

For systems or enclosures with a SCSI ID cable, install the SCSI ID cable as shown in FIGURE 1-2 and set the SCSI ID for the tape drive using the SCSI ID switch on the system or enclosure.

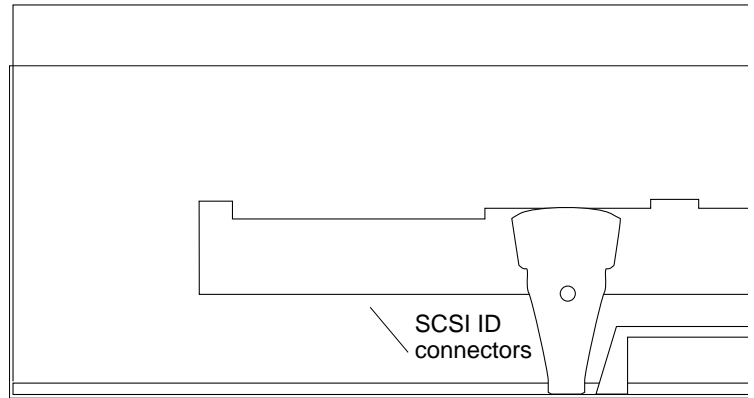


FIGURE 1-2 SCSI ID Connectors

For systems or enclosures that do not have a SCSI ID cable, connect the jumpers as shown in FIGURE 1-3.

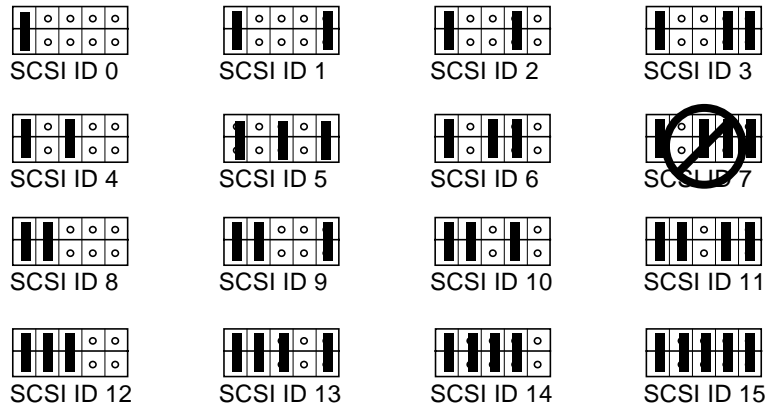


FIGURE 1-3 Setting SCSI ID Jumpers

Note – Although there are other switches and connectors on the tape drive, they are inactive in Sun configurations.

7. Power on your peripherals and then your system.

Note – If your system starts to reboot, interrupt the reboot process by pressing the Stop and A keys together.

8. Reboot your system using the `boot -r` command.

9. Load a tape cartridge into the tape drive (see “Loading a Tape Cartridge” on page 13).

Wait for the tape drive to fully load the tape cartridge.

Note – If all of the LEDs on the right or left side of the tape drive front panel are blinking, then the tape drive has failed its power-on self-test (POST). Go to “Troubleshooting” on page 6.

10. Determine to which remote number the tape drive has been mapped.

a. Process the remote numbers in the `/dev/rmt` directory.

```
# ls -l /dev/rmt/? | sed 's/.*rmt\\/'
```

For example, a system with two tape drives (one connected to an internal SCSI host adapter and one to an external host adapter) might return:

```
# ls -l /dev/rmt/? | sed 's/.*rmt\\/'
0 -> ../../devices/iommu@f,e0000000/sbus@f,e0001000/dma@f,81000/esp@f,80000/st@4,0:
1 -> ../../devices/iommu@f,e0000000/sbus@f,e0001000/QLGC,isp@2,10000/st@5,0:
```

Remote number

SCSI host adapter

SCSI ID

b. Find the remote number that contains the controller and SCSI ID (st) number for the tape drive you installed.

In the previous example, the remote number 0 would be used for a tape drive connected to SCSI ID 4 on SCSI host adapter at `dma@f,81000/esp@f,80000`.

11. Verify that the system recognizes the tape drive.

```
# mt -f /dev/rmt/remote_number status
```

A correct response would resemble:

```
#mt -f /dev/rmt/3 status
Other tape drive:
  sense key (0x0)= No Additional Sense residual= 0 retries= 0
  file no= 0 block no= 0
#
```

Other tape drive on the first line of the output indicates that the tape drive is correctly recognized. If one of the following error messages is displayed, troubleshoot as follows:

- No tape loaded or drive offline indicates there is no cartridge in the drive or that the cartridge is not yet loaded. Install a cartridge or wait for the cartridge load to complete and then retry the `mt status` command.
- No such file or directory indicates there is no tape drive attached to that `rmt` (remote) number. Try another remote number.
- SCSI tape drive indicates the `st.conf` entry is incorrect. You must edit the `st.conf` file (see APPENDIX A) and reboot.

The Tape In Use LED should be lit, signifying that the drive is ready for use. Go to Chapter 2.

Note – If the tape drive does not complete POST, or if the right or left side LEDs blink repeatedly, go to “Troubleshooting” on page 6.

Troubleshooting

If the tape drive fails during POST or operation, use Table 1-1 to identify the problem and determine what action to take.

TABLE 1-1 Troubleshooting

Symptom:	Your system does not recognize the DLT8000 tape drive.
Action:	Make sure that: <ul style="list-style-type: none">• The SCSI ID is unique.• The SCSI cable is not loose.• The SCSI bus is correctly terminated.• You have rebooted the system using the <code>boot -r</code> command.
Symptom:	All LEDs on the right or left side of the tape drive front panel blink.
Action:	Unload the tape and reinitialize the drive by pressing the Unload button, or power off the tape drive, wait 15 seconds, and then power it on again. The right or left side LEDs should stop blinking, and the drive should try to reinitialize. If the test succeeds, the LEDs should turn on steady, and then turn off. If all right or left side LEDs continue blinking, the drive has a hardware failure.

Operation

This chapter gives details of the basic operation of the Sun StorEdge DLT8000 tape drive, and provides a description of the front panel LED indicators.

This chapter is organized as follows:

- “Front Panel Controls and LED Indicators” on page 7.
- “Tape Cartridge” on page 10.
- “Selecting Density” on page 14.
- “System Diagnostic Support” on page 16.

Front Panel Controls and LED Indicators

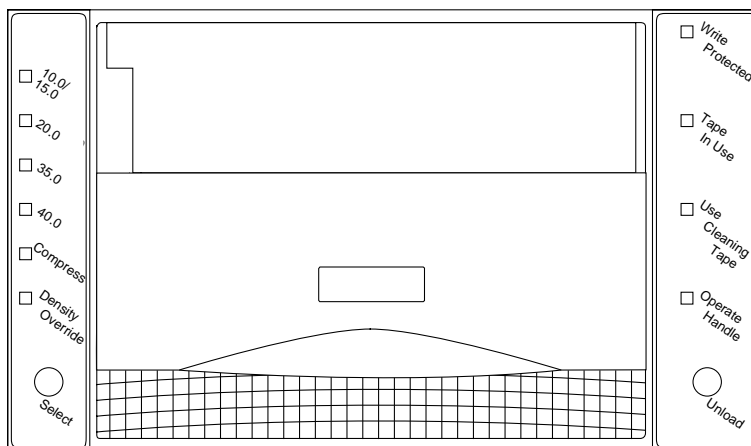


FIGURE 2-1 DLT8000 Front Panel

Left Front Panel LEDs

TABLE 2-1 Left Front Panel LEDs

LED	State	Operating Condition
10.0/15.0	On/blinking ¹	Tape is recorded in 10.0 or 15.0 Gbyte format.
20.0	On/blinking ¹	Tape is recorded in 20.0 Gbyte format.
35.0	On/blinking ¹	Tape is recorded in 35.0 Gbyte format.
40.0	On/blinking ¹	Tape is recorded in 40.0 Gbyte format.
Compress ²	On	Compression mode is enabled.
	Off	Compression mode is disabled.
Density Override	On	You selected a density from the front panel.
	Off	Density will be selected by the host.
	Blinking	The tape drive is in density selection mode.
All LEDs	On	POST is starting.
	Blinking	A POST error occurred.

1. A blinking LED signifies that you have used the Select button to choose a density other than the tape cartridge's default or pre-recorded density.

2. Compression can only be done in 10, 15, 20, 35, and 40 Gbyte densities.

Select Button

The Select button is used to select the record density of the tape cartridge. See “Selecting Density” on page 14 for more information.

Cartridge Insert/Release Handle

Use the cartridge insert/release handle (only when the Operate Handle LED is on) to load or eject a cartridge. The handle lifts to the open position and lowers to the closed position.

Right Front Panel LEDs

TABLE 2-2 Right Front Panel Led

LED	State	Operating Condition
Write Protected	On	Tape is write-protected.
	Off	Tape is write-enabled.
Tape In Use	On	Tape is loaded and ready for use.
	Blinking	Tape is in use.
Use Cleaning Tape	On	Drive head needs cleaning, or the tape is bad (see “To Clean the Drive Head” on page 14).
	Off	Cleaning is complete, or cleaning is unnecessary.
Operate Handle	On	OK to use the cartridge insert/release handle.
	Off	Do not use the cartridge insert/release handle.
All LEDs	On	POST is starting.
	Blinking	An error has occurred. See Table 1-1.

Unload Button

The Unload Button is used primarily to unload the tape. When you push the Unload button, the drive waits until any active write-to-tape activity is completed before beginning the unload sequence. See “To Unload a Tape Cartridge From the Tape Drive” on page 13.

If the drive is in an error state, pushing the Unload button causes the drive to reset and unload the tape if possible. See “Troubleshooting” on page 6.

Tape Cartridge

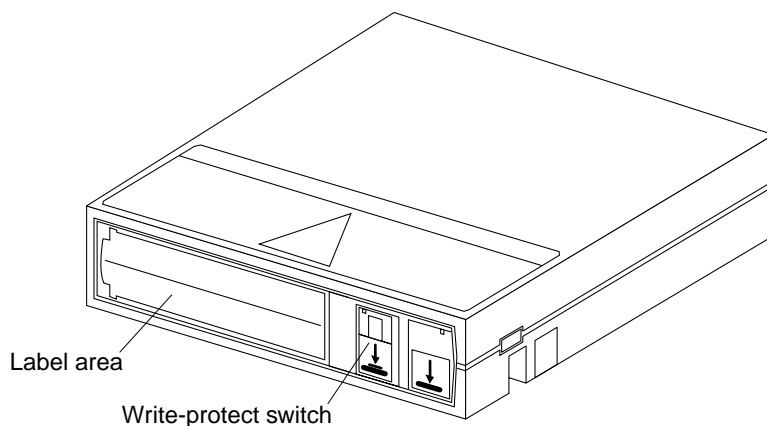


FIGURE 2-2 DLT Tape Cartridge

The DLT8000 tape drive uses type III, IIIxt, and IV DLT tape cartridges. These tape cartridges contain 1/2-inch magnetic metal particle tape.

TABLE 2-3 Tape Cartridge Specifications

Type	Length	Native Capacity	Compressed Capacity ¹	Color
III	356m (1167 ft)	10 Gbytes	20 Gbytes	Gray/brown
IIIxt	541m (1778 ft)	15 Gbytes	30 Gbytes	White
IV	541m (1778 ft)	35 Gbytes	70 Gbytes	Black
IV	541m (1778 ft)	40 Gbytes	80 Gbytes	Black

1. Assumes a typical compression ratio of 2:1. The compression ratio may vary depending upon the type of data being compressed.

Write Protect

The tape cartridge has a write-protect switch (FIGURE 2-1) to prevent accidental erasure of data. This switch can be set prior to or after inserting the tape cartridge into the tape drive.

- To write protect a tape cartridge, move the switch to the left so that a small rectangle is visible.
- To write enable a tape cartridge, move the switch to the right so that the rectangle is not visible.

If the write-protect switch is changed while the tape cartridge is being written to by the tape drive, the change does not take effect until the current write operation completes.

Handling and Storage



Caution – Do not drop or bang the tape cartridge. This can displace the tape leader, making the tape cartridge unusable and possibly damaging the drive.

Follow these guidelines when handling tape cartridges:

- Do not forcibly remove a tape cartridge from the drive. If a cartridge is difficult to remove, reinsert the tape cartridge, wait for the tape cartridge to load, and then try to unload the tape cartridge again.
- Do not use adhesive labels on the tape cartridge. Use only the labels that fit into the tape cartridge label area. Using other labels may cause the tape cartridge to jam in the tape drive.
- Do not move the tape drive with a tape cartridge loaded; doing so can damage the tape cartridge.

When not in use, return a tape cartridge to the plastic enclosure it was shipped in and store it in a clean, dust-free environment. In addition:

- Store tape cartridges in temperatures between 20°C and 30°C (68°F to 86°F). For longer tape cartridge life, store tape cartridges at a stable relative humidity and as close to 40% relative humidity as possible.
- Keep tape cartridges out of direct sunlight and away from heaters and other heat sources.
- Keep tape cartridges away from electromagnetic interference sources, such as terminals, motors, and video or X-ray equipment. Data on tape can be altered.

Note – If a tape cartridge has been exposed to extreme heat or cold, stabilize the cartridge at room temperature for the same amount of time it was exposed (up to 24 hours).

▼ To Load a Tape Cartridge Into the Tape Drive

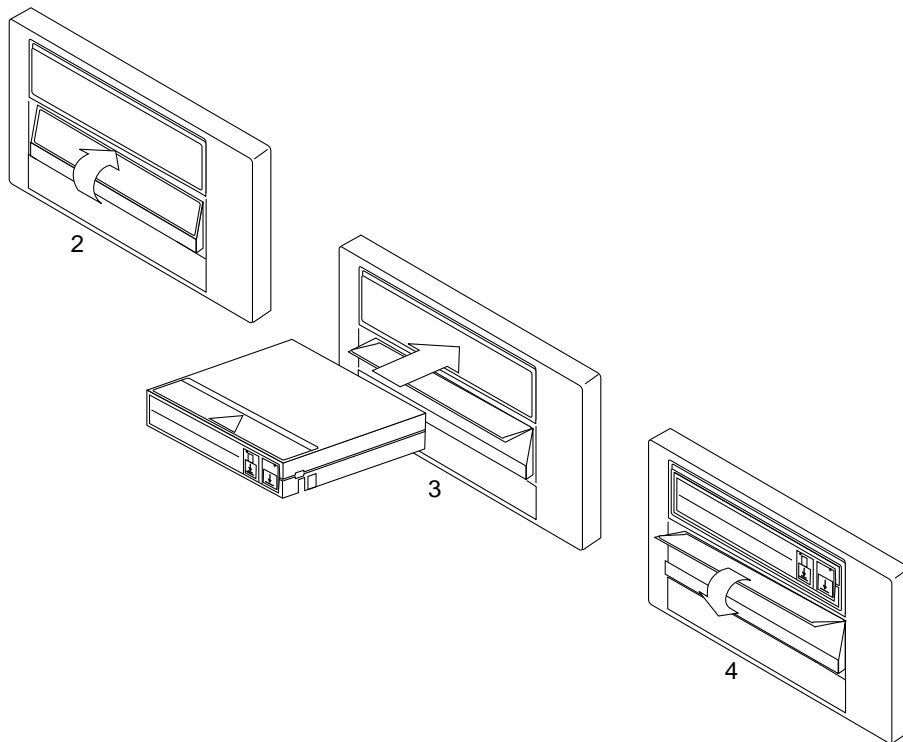


FIGURE 2-3 Loading a Tape Cartridge

- 1. Make sure that the Operate Handle LED is on (FIGURE 2-1).**
- 2. Lift the cartridge insert/release handle (FIGURE 2-1).**
- 3. Insert the cartridge into the tape drive.**

4. Gently push the handle closed.

The Operate Handle LED turns off and the Tape In Use LED blinks to show the tape is loading. When the tape is loaded, the Tape In Use LED turns on steadily. The tape is now ready for use.

▼ To Unload a Tape Cartridge From the Tape Drive

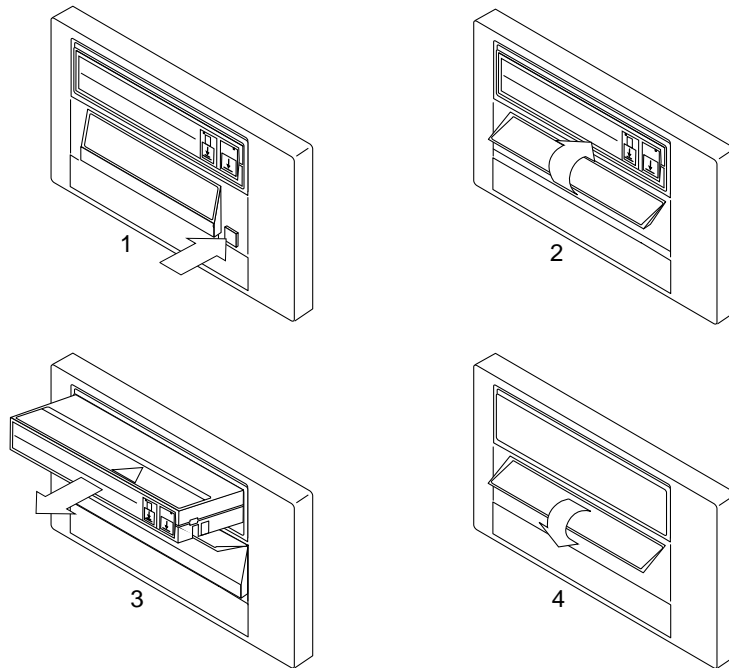


FIGURE 2-4 Unloading a Tape Cartridge



Caution – Remove a tape cartridge from the drive before turning off the host system power. Failure to remove a tape cartridge can result in cartridge and drive damage.

1. Press the Unload button (FIGURE 2-1).

The Tape In Use LED blinks as the tape rewinds. This may take between 17 seconds and two minutes.

2. When the Operate Handle LED turns on, pull the cartridge insert/release handle open to eject the cartridge.

3. **Remove the cartridge.**
4. **Push the handle closed.**

▼ To Clean the Drive Head



Caution – Use only a DLT Type III cleaning tape cartridge to clean the tape drive.

The Use Cleaning Tape LED lights when the tape drive needs cleaning.

1. **Load the cleaning tape cartridge into the tape drive (see “To Load a Tape Cartridge Into the Tape Drive”).**

Note – If the Use Cleaning Tape LED lights after you load the cleaning tape cartridge, cleaning has not been done because the cleaning tape cartridge is expired. Replace the cleaning tape cartridge. A cleaning tape usually lasts about 20 cleanings.

2. **Wait for the cleaning process to complete.**

The Tape In Use LED stops blinking and the Operate Handle LED lights.

3. **Unload the cleaning tape cartridge (see “To Unload a Tape Cartridge From the Tape Drive”).**
4. **Record the date of the cleaning on the cartridge label.**

Note – If a data cartridge causes the Use Cleaning Tape LED to blink or the Use Cleaning Tape LED still lights after you clean the drive head, then the data cartridge may be damaged. Try another data tape cartridge. If the second tape cartridge works, then back up your original tape cartridge onto another tape cartridge. Discard the old tape cartridge.

Selecting Density

You can select the density at which the tape cartridge will record data by using the Select button on the front panel or by using a software command. In either case, the new density does not take effect until a write from “beginning of tape” (BOT) is executed. Until then, the original density will be used.

Note – Blank tape cartridges do not have default densities. None of the density LED indicators on the front panel will light until data has been written to the tape.

Table 2-4 shows the densities you can be select for the tape drive.

TABLE 2-4 Selectable Densities

Tape Type	Selectable Densities (in Gbytes)
III	2.6, 6.0, 10.0 native or 10.0 compressed
IIIxt	15.0 native
IV	20.0, 35.0/40.0 native or 20.0, 35.0/40.0 compressed

▼ To Select Density Using the Front Panel

1. Load the tape cartridge into the tape drive.

The Tape In Use LED blinks while the tape loads. After the tape is loaded, the Tape In Use LED remains lit. The LEDs on the left side of the drive light to show the tape cartridge's prerecorded density.

2. Press the Select button until the LED(s) showing the density you want lights.

The original density LED(s) will go out. The selected density LED(s) will be on steadily and the Density Override LED will blink. Then the selected density will blink and the LED(s) for the original density and the Density Override LED will be on steadily.

3. When a write from BOT occurs, the selected density will be used.

The selected density and the Density Override LEDs are on steadily.

▼ To Select Density Using Software Commands

1. Choose a density specifier from Table 2-5.

TABLE 2-5 Density Specifiers

Density Specifiers	Cartridge Types and Capacities		
	Type IV	Type IIIxt	Type III
l	35 Gbytes	15 Gbytes	10 Gbytes
m	70 Gbytes ¹	30 Gbytes ¹	20 Gbytes ¹
h	40 Gbytes	15 Gbytes	10 Gbytes
u	80 Gbytes ¹	30 Gbytes ¹	20 Gbytes ¹

1. Assumes a typical compression ratio of 2:1. The compression ratio may vary depending upon the type of data being compressed.

2. Type the `mt` command with the appropriate density specifier.

For example:

```
# mt -f /dev/rmt/3u rewind
```

See the `st` and `mt` man pages for more information.

System Diagnostic Support

If you are using the SunVTS™ 1.0 diagnostic software, which was distributed with the Solaris 2.5 operating environment, you must first apply patch number 103097-01 to your system. SunVTS 2.0 diagnostic software and later versions do not require a patch. You can obtain any needed patches through your normal service channels.

This tape drive is not supported by the SunDiag™ diagnostic software.

Modifying the `st.conf` File

The Solaris operating environment recognizes all tape drives and autoloaders that were supported by Sun when your operating environment was released. If your system uses Solaris releases 2.5, 2.5.1, 2.6, or 2.7—all of which were released before the DLT8000 tape drive—you must modify the `/kernel/drv/st.conf` file so that your operating environment will recognize the DLT8000 drive.

Note – No `st.conf` modification is required for these operating environments:
Solaris 7: using Sun PatchID 107460-xx.
Solaris 8: using Sun PatchID 108725-xx.

If you are familiar with this procedure, go to “Modifying the `st.conf` File” on page 22. For more information on this procedure, go to “Understanding the `st.conf` File” on page 20.

Understanding the `st.conf` File

The beginning of the `st.conf` file contains values you can use to configure third-party or other unsupported tape drives. These values are divided into three sections:

- `tape-config-list`
- Tape device identifiers
- Configuration values

`tape-config-list`

The line:

```
#tape-config-list=
```

indicates the start of values that the operating environment will use to configure previously unsupported tape devices.

Note – There can be only one active (uncommented) `tape-config-list=` line in the `st.conf` file.

Tape Device Identifiers

The next section includes lines like:

```
# "ARCHIVE Python 28454","Archive Python 4mm Helical Scan","ARCH_Python",  
# "ARCHIVE Python 29279","Archive Python 4mm DAT Stacker","ARCH_Python",
```

and ends with a line like:

```
# "\076\000", "Fujitsu 1/2\"Cartridge", "Fujitsu_half";
```

1

2

3

where:

1. The information about the tape device that the operating environment “sees” when it “looks at” a tape device.
2. The information the operating environment outputs when queried about the tape device (by programs such as SunVTS diagnostic software).
3. A string that acts as a pointer to values that will be used to configure the tape device.

Note – The first two lines of the example end in commas. The last line in the example ends with a semicolon. You must follow this format when adding multiple tape devices to the `st.conf` file.

Configuration Values

The third section contains the values that will be used to configure the tape devices. It has lines like:

```
# ARCH_Python = 1,0x2c,0,0xde39,4,0x00,0x8c,0x8c,0x8c,3;
```

The part of the line before the equal sign (=) is the string that is linked to the values that will be used to configure a tape device. The second part of the line contains the configuration values. These values are defined in the `st man` page.

If you look at the first two examples in the Tape Device Identifiers section, you will see that both the `ARCHIVE Python 28454` and the `ARCHIVE Python 29279` lines end with the string `ARCH_Python`. This means that the operating environment will configure both tape devices according to the parameters set in the `ARCH_Python` line.

Note – Each line in the configuration section must start with a unique string. Also, each line in this section ends in a semicolon (;).

▼ To Modify the `st.conf` File

Read this entire procedure before editing the `st.conf` file.

Note – The syntax is critical. Verify the placement of commas, semicolons, and beginning and ending quotation marks.

1. Become superuser.

```
% su
Password:
#
```

2. Make a copy of the original `st.conf` file as a backup (`st.conf.old`).

```
# cp /kernel/drv/st.conf /kernel/drv/st.conf.old
```

3. Edit the `st.conf` file.

Using an editor, scroll through the `st.conf` file to the following line:

```
#tape-config-list=
```

a. Delete the `#` character that begins the line, if it has not already been removed.

b. Scroll down until you come to the end of the “Tape Device Identifiers” section.

The line will look something like:

```
# "\076\000","Fujitsu 1/2\" Cartridge", "Fujitsu_half";
```

c. On the next line, add the following entry exactly as shown:

```
"QUANTUM DLT8000", "Quantum DLT 8000", "QDLT8";
```

Note – If multiple devices are enabled (lines uncommented), only the last uncommented lines with this format must end with a semicolon. All previous lines with this format must end with a comma.

- d. Using the editor, continue to scroll until you come to the end of the “Configuration Values” section.

The line will look something like:

```
#WtQIC = 1, 0x32, 512, 0x0624, 1, 0x00, 0;
```

- e. On the next line, add the following entry exactly as shown:

```
QDLT8 = 1, 0x36, 4, 0x9639, 0x84, 0x85, 0x88, 0x89, 3;
```

Note – All lines in this section end with semicolons.

- f. Save and exit the file.
4. Go to Step 2 on page 1 and continue the installation procedure.

Specifications

This appendix contains the specifications for the Sun StorEdge DLT8000 tape drive.

Physical Specifications

TABLE B-1 Physical Specifications

Form Factor	Width	Depth	Height	Weight
133.35 mm	149.0 mm	243.8 mm	86.3 mm	2.0 kg
5.25 in.	5.87 in.	9.6 in.	3.4 in.	6.7 lb

Electrical Specifications

TABLE B-2 Electrical Specifications

Specification	5V (±5%)	12V (±10%)
Steady state	2.8A	1.2A
Maximum ¹	4.35A	4.5A

1. Maximum values are for about 300 ms duration.

Interface and Performance Specifications

TABLE B-3 Interface and Performance Specifications

Specification	Value
Buffer size	8 Mbytes
Transfer Rates (maximum)	
User native:	6.0 Mbytes/sec
User compressed:	12 Mbytes/sec

Timing Specifications

TABLE B-4 Timing Specifications

Specification	Value
Read/Write tape speed	4267 mm/sec – 168 in./sec
Rewind tape speed	4445 mm/sec – 175 in./sec
Linear search tape speed	4445 mm/sec – 175 in./sec
Rewind times	
Average	1 min
Maximum	2 min
Access times (from BOT)	
Average	1 min
Maximum	2 min
Load to BOT (previously written)	37 sec ¹
Unload from BOT	17 sec

1. The time is slightly longer if you are using a blank tape.

Tape Cartridge Specifications

TABLE B-5 Tape Cartridge Specifications

Type	Length	Native Capacity	Compressed Capacity ¹
III	356m (1167 ft)	10 Gbytes	20 Gbytes
IIIxt	541m (1778 ft)	15 Gbytes	30 Gbytes
IV	541m (1778 ft)	35/40 Gbytes	70/80 Gbytes

1. Assumes a typical compression ratio of 2:1. The compression ratio may vary depending upon the type of data being compressed.

Quality Specifications

TABLE B-6 Quality Specifications

Specification	Value
Mean Time Before Failure (MTBF)	250,000 hrs ¹
Head life	50,000 tape motion hours, average
Error rates	
Recoverable Read	1 in 10 ⁶ bits read
Unrecoverable Read	1 in 10 ¹⁷ bits read
Undetected Read	1 in 10 ²⁷ bits read
Tape life	1,000,000 passes
1. Sun Microsystems, Inc. does not warrant that the predicted MTBF is representative of any particular unit installed for customer use. Actual figures may vary from unit to unit.	